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10/642,477	08/15/2003	Masakazu Kawai	20911-08172	3831

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EXAMINER	
HOEKSTRA, JEFFREY GERBEN	
ART UNIT	**PAPER NUMBER**
3736	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/642,477	KAWAI ET AL.	
	Examiner	Art Unit	
	Jeffrey G. Hoekstra	3736	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 March 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12* is/are pending in the application.

4a) Of the above claim(s) *9-12* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/03/07, 01/16/07, 03/12/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Notice of Amendment

1. In response to the amendment filed on 03/08/2007, amended claims 1-3 and 8 is/are acknowledged. The following new and reiterated grounds of rejection are set forth:

Information Disclosure Statement

2. The information disclosure statement(s) (IDS) submitted on 01/03/2007, 01/16/2007, and 03/12/2007 is/are acknowledged. The submission is in compliance with the provisions of 37 CFR 1.97 and 1.98. Accordingly, the examiner is considering the information disclosure statement(s).

Specification

3. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01.

The omitted structural cooperative relationships are: (a) the structure that applies torques to the joints of the legs based on the moments acting around the joints of the legs, (b) the structure operative for determining which leg or legs are in contact with the ground, (c) the structure operative for obtaining an attitude of the leg, (d) the structure operative for obtaining the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg, (e) the structure operative for obtaining the vertical component of an actual ground reaction force acting on the leg based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg; obtaining an actual point of application of the ground reaction force based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg, and (f) the structure operative for obtaining moments acting around the joints of the leg, using the vertical component of the ground reaction force acting on the leg at the point of application of the ground reaction force, the vertical components of forces acting on the joints of the leg and a term of the acceleration of gravity and without using the horizontal components of the forces acting on the joints of the leg and a term of acceleration except the term of the acceleration of gravity.

The rationale for considering the omitted structural cooperative relationships of elements critical and/or essential is (a) the method as claimed is inoperative without the positive recitation of the critical structural limitations responsible for and operative to perform the manipulation of abstract ideas leading up the application of torques to the joints of a leg and (b) the method as claimed is inoperative without the positive recitation of the critical structural limitations responsible for and operative to perform apply torques to the joints of a leg.

7. Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are *at least*: (a) the leg-motion determining module (25), (b) the leg-attitude computing module (32), (c) the body center of gravity location computing module (41), (d) the center of gravity acceleration computing module (42), (e) the ground reaction-force estimating module (60), (f) the module (50) for estimating a point of application of ground reaction force, (g) the joint moment estimating module (71), (h) the gravity compensation torque-computing module (72), (i) the associated sensors (14, 15, and 19-24) responsible for inputting data to the modules, and (j) the processor (16) provided with the functional modules to perform calculations therewith.

8. Claim 8 recites the limitation "the vertical component of acceleration of the center of gravity" in lines 6-7. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 1, 2, 4, and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Park et al (IDS 09/06/2006, Cite No: C41).

11. For claims 1 and 8, Park et al discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system (pages 3528-3533) as broadly as structurally claimed, comprising the steps of:

- determining which leg or legs are in contact with the ground;
- obtaining an attitude of the leg;
- obtaining the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg;
- obtaining the vertical component of an actual ground reaction force acting on the leg based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg;
- obtaining an actual point of application of the ground reaction force based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg based on a position of the center of gravity of the

whole body, positions of ankle joints and positions of joints at front ends of feet under normal condition and based on positions of the joints at front ends of feet when going up or down stairs or going uphill or downhill, wherein it is determined based on positions of the ankle joints while the both legs are in contact with the ground whether the system is under normal condition or going up or down stairs or going uphill or downhill;

- obtaining moments acting around the joints of the leg, using the vertical component of the ground reaction force acting on the leg at the point of application of the ground reaction force, the vertical components of forces acting on the joints of the leg and a term of the acceleration of gravity and without using the horizontal components of the forces acting on the joints of the leg and a term of acceleration except the term of the acceleration of gravity; and
- obtaining the torques to be applied to the joints of the leg, based on the moments acting around the joints of the leg.

12. For claim 2, Park et al discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein the step of determining which leg or legs are in contact with the ground, the determination is made based on a value of the vertical component of acceleration measured on the body.

13. For claim 4, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein in the step of obtaining an actual point of application of the ground reaction force, the point is obtained based additionally on additionally on a location of the center of gravity of the body.

14. For claim 6, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein the vertical component of acceleration of the center of gravity of the whole body, is obtained based on locations of the centers of gravity of portions of the body, obtained based on attitudes of the leg and other portions of the body, and the vertical component of acceleration measured at the body.

15. For claim 7, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein in the step of obtaining moments acting around the joints of the leg, at first the vertical component of a force acting on and a moment acting around the knee joint of the shin, are obtained using the vertical component of the ground reaction force acting on the shin at the point of application of the ground reaction force and a term of acceleration of gravity and without using the horizontal component of the ground reaction force and a term of acceleration except the term of the acceleration of gravity and then the vertical component of a force acting on and a moment acting around the hip joint of the thigh, are obtained using the vertical component of a force acting on and a moment acting around the knee joint of the thigh and a term of the acceleration of gravity without using the horizontal component of the horizontal component of the force acting on the knee joint and a term of acceleration except the term of the acceleration of gravity.

16. Claims 1, 2, 4, and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Winter et al (IDS 09/06/2006, Cite No: C53).

17. For claims 1 and 8, Park et al discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system (pages 75-102) as broadly as structurally claimed, comprising the steps of:

- determining which leg or legs are in contact with the ground;
- obtaining an attitude of the leg;
- obtaining the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg;
- obtaining the vertical component of an actual ground reaction force acting on the leg based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg;
- obtaining an actual point of application of the ground reaction force based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg based on a position of the center of gravity of the whole body, positions of ankle joints and positions of joints at front ends of feet under normal condition and based on positions of the joints at front ends of feet when going up or down stairs or going uphill or downhill, wherein it is determined based on positions of the ankle joints while the both legs are in contact with the ground whether the system is under normal condition or going up or down stairs or going uphill or downhill;

- obtaining moments acting around the joints of the leg, using the vertical component of the ground reaction force acting on the leg at the point of application of the ground reaction force, the vertical components of forces acting on the joints of the leg and a term of the acceleration of gravity and without using the horizontal components of the forces acting on the joints of the leg and a term of acceleration except the term of the acceleration of gravity; and
- obtaining the torques to be applied to the joints of the leg, based on the moments acting around the joints of the leg.

18. For claim 2, Park et al discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein the step of determining which leg or legs are in contact with the ground, the determination is made based on a value of the vertical component of acceleration measured on the body.

19. For claim 4, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein in the step of obtaining an actual point of application of the ground reaction force, the point is obtained based additionally on additionally on a location of the center of gravity of the body.

20. For claim 6, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein the vertical component of acceleration of the center of gravity of the whole body, is obtained based on locations of the centers of gravity of portions of the body, obtained based on attitudes of the leg and other portions of the body, and the vertical component of acceleration measured at the body.

For claim 7, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein in the step of obtaining moments acting around the joints of the leg, at first the vertical component of a force acting on and a moment acting around the knee joint of the shin, are obtained using the vertical component of the ground reaction force acting on the shin at the point of application of the ground reaction force and a term of acceleration of gravity and without using the horizontal component of the ground reaction force and a term of acceleration except the term of the acceleration of gravity and then the vertical component of a force acting on and a moment acting around the hip joint of the thigh, are obtained using the vertical component of a force acting on and a moment acting around the knee joint of the thigh and a term of the acceleration of gravity without using the horizontal component of the horizontal component of the force acting on the knee joint and a term of acceleration except the term of the acceleration of gravity.

21. Claims 1, 2, 4, and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Kato et al (IDS 12/03/2003, Cite No: 1).

22. For claims 1 and 8, Park et al discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system (pages 1-15) as broadly as structurally claimed, comprising the steps of:

- determining which leg or legs are in contact with the ground;
- obtaining an attitude of the leg;
- obtaining the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg;

- obtaining the vertical component of an actual ground reaction force acting on the leg based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg;
- obtaining an actual point of application of the ground reaction force based on which leg or legs are in contact with the ground, the attitude of the leg and the vertical component of acceleration of the center of gravity of the whole body including the leg and the attitude of the leg based on a position of the center of gravity of the whole body, positions of ankle joints and positions of joints at front ends of feet under normal condition and based on positions of the joints at front ends of feet when going up or down stairs or going uphill or downhill, wherein it is determined based on positions of the ankle joints while the both legs are in contact with the ground whether the system is under normal condition or going up or down stairs or going uphill or downhill;
- obtaining moments acting around the joints of the leg, using the vertical component of the ground reaction force acting on the leg at the point of application of the ground reaction force, the vertical components of forces acting on the joints of the leg and a term of the acceleration of gravity and without using the horizontal components of the forces acting on the joints of the leg and a term of acceleration except the term of the acceleration of gravity; and
- obtaining the torques to be applied to the joints of the leg, based on the moments acting around the joints of the leg.

23. For claim 2, Park et al discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein the step of determining which leg or legs are in contact with the ground, the determination is made based on a value of the vertical component of acceleration measured on the body.

24. For claim 4, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein in the step of obtaining an actual point of application of the ground reaction force, the point is obtained based additionally on additionally on a location of the center of gravity of the body.

25. For claim 6, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein the vertical component of acceleration of the center of gravity of the whole body, is obtained based on locations of the centers of gravity of portions of the body, obtained based on attitudes of the leg and other portions of the body, and the vertical component of acceleration measured at the body. For claim 7, discloses a method for obtaining in real time torques to be applied to joints of a leg of a biped walking system, wherein in the step of obtaining moments acting around the joints of the leg, at first the vertical component of a force acting on and a moment acting around the knee joint of the shin, are obtained using the vertical component of the ground reaction force acting on the shin at the point of application of the ground reaction force and a term of acceleration of gravity and without using the horizontal component of the ground reaction force and a term of acceleration except the term of the acceleration of gravity and then the vertical component of a force acting on and a moment acting around the hip joint of the thigh, are obtained using the vertical

component of a force acting on and a moment acting around the knee joint of the thigh and a term of the acceleration of gravity without using the horizontal component of the horizontal component of the force acting on the knee joint and a term of acceleration except the term of the acceleration of gravity.

Claim Rejections - 35 USC § 103

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

27. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

28. Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al in view of Tagami et al (US 5,808,433). Park et al discloses the claimed invention except for in the step of determining (a) which leg or legs are in contact with the ground and/or (b) a point of application of the ground reaction force, the determination and/or point of application is made using information from a sensor.

Tagami et al teaches using a sensor in a biped walking system (column 6 lines 12-24, column 10 lines 13-21, and column 14 lines 48-57). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as taught by Park et al, with the sensor of Tagami et al for the purpose of increasing the efficacy of controlled movement in a biped walking system.

29. Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Winter et al in view of Tagami et al (US 5,808,433). Winter et al discloses the claimed invention except for in the step of determining (a) which leg or legs are in contact with the ground and/or (b) a point of application of the ground reaction force, the determination and/or point of application is made using information from a sensor. Tagami et al teaches using a sensor in a biped walking system (column 6 lines 12-24, column 10 lines 13-21, and column 14 lines 48-57). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as taught by Winter et al, with the sensor of Tagami et al for the purpose of increasing the efficacy of controlled movement in a biped walking system.

30. Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato et al in view of Tagami et al (US 5,808,433). Kato et al discloses the claimed invention except for in the step of determining (a) which leg or legs are in contact with the ground and/or (b) a point of application of the ground reaction force, the determination and/or point of application is made using information from a sensor. Tagami et al teaches using a sensor in a biped walking system (column 6 lines 12-24, column 10 lines 13-21, and column 14 lines 48-57). It would have been obvious to one

having ordinary skill in the art at the time the invention was made to modify the method as taught by Kato et al, with the sensor of Tagami et al for the purpose of increasing the efficacy of controlled movement in a biped walking system.

Response to Arguments

31. Applicant's arguments with respect to claims 1-8 have been considered but are moot in view of the new ground(s) of rejection. However, the Examiner notes the following:

32. Applicant's arguments filed 03/08/2007 have been fully considered but they are not persuasive. Applicant argues the rejections of the claims under Park et al, Winters et al, and Kato et al. Specifically arguing as claimed, (a) Park et al fails to disclose, teach or fairly suggest "how to obtain an actual point of application of ground reaction force to the walking system", (b) Winter et al fails to disclose, teach or fairly suggest "how to obtain an actual point of application of the ground reaction force", and (c) Kato et al fails to disclose, teach or fairly suggest "how to obtain an actual point of application of the ground reaction force". The Examiner disagrees, maintains Park et al, Winter et al, and Kato et al anticipate the claims, and presents the following:

33. In response to applicant's arguments (a), the recitation 'a biped walking system" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190

USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

34. In response to applicant's arguments (a)-(c) that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "how to obtain an actual point of application of the ground reaction force") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). It is noted, Applicant claims obtaining an actual point of application of the ground reaction force, but does not claim how the actual point of application of the ground reaction force is obtained, see paragraphs 4-6 above.

35. In response to applicant's arguments (a)-(c) that the references fail to show certain features of applicant's invention, the Examiner notes as broadly as claimed Park et al discloses obtaining an actual point of application of the ground reaction force via estimation by calculation (Park et al, page 3529 left column), Winter et al discloses obtaining an actual point of application of the ground reaction force via estimation by calculation (Winter et al, page 77 section 2, page 85 section 4.2.2, and page 89 section 4.2.4), and Kato et al discloses obtaining an actual point of application of the ground reaction force via estimation by calculation (Kato et al, pages 10-12 section 4).

Conclusion

36. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey G. Hoekstra whose telephone number is (571)272-7232. The examiner can normally be reached on Monday through Friday, 8:00 a.m. to 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Max F. Hindenburg can be reached on (571)272-4726. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JH

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